Ad Hoc Subcommittee for Permafrost Exchange

Review of Intelligence Aspects of Exchange with the USSR in the Field of Permafrost

1. Net Intelligence Advantage

a. Potential US intelligence gain from exchange

Background--The USSR, with a history of over 20 years of organized research on permafrost, has become highly capable in understanding permafrost (permanently frozen ground) and thus overcoming the wide spread adverse effects of this phenomenon in the development of the Soviet North. Under the impetus of the current International Geophysical Year, the USSR is expanding its permafrost research and thus becoming progressively more proficient in controlling and utilizing this natural phenomenon, particularly in construction. Expanded research on permafrost materially increases military, economic, and agricultural development of the Soviet North in the form of improved strategic airstrips, possible missile launching sites, roads, railroads, mineral prospecting, mining and agricultural operations, industrial and hydroelectric structures, and water supply. Any significant development of Soviet northern military and economic potentials is important to US national security and falls within the scope of Second Priority Objectives 1.a.b. and 2 of IAC-D-50/8, 27 December 1955 (as revised 5 March 1957).

(1) Basic laboratory and field research on permafrost--The USSR has been very active in basic research in permafrost for many years and is the world leader in this general field. The US would stand to gain much by observing current Soviet laboratory and field operations devoted to basic research in this field. Data obtained through observation of current Soviet work on the origin, extent (mapping and photo interpretation), thickness, thermal regime, fluctuation, physical and mechanical properties, and destructive action of permafrost would allow a first-hand US evaluation of this research. Important basic research questions now being considered by the Soviets but not by the US include the following:

a. Ice ratio or the amount of free water in frozen ground (up to 11% of total moisture) and its possible affect on bearing capacity and trafficability.

b. Effect of varying ground particle size on nature of permafrost and utilization of this concept in mapping of frozen ground.

c. Migration of water in the capillaries during the process of freezing.

d. Computation of heat transfer in the freezing and frozen ground.

Knowledge gained by US researchers in observing as yet unpublished results of Soviet field and laboratory basic research in these or related fields will aid in advancing future US research.

(2) Permafrost research related to airstrip, road, and railroad construction--Observations of Soviet efforts in locating and constructing airstrips, roads, and railroads in permafrost would be valuable in order to show how the Soviets deal with permafrost problems in such engineering projects. The ability of the Soviets to utilize permafrost research to develop and maintain these types of engineering structures reflects in large part their capabilities in northern overland communications and transport.

(3) Permafrost research related to industrial and city development -- Observations by qualified US personnel of Soviet techniques for constructing dams, bridges, hydroelectric and industrial plants, and other

large buildings would be valuable. Special types of foundation piles and construction materials (such as cement) in current use would indicate recent Soviet trends and advances. Also the extent of permafrost damage to large structures could be observed and weaknesses in Soviet methodology deduced.

(4) Other applications of permafrost research -- First-hand observations of specialized permafrost research relating to predicting permafrost conditions, prospecting and mining operations, as well as to agricultural, cold storage, and water supply development would be of value to US researchers.

(5) Organization of permafrost research -- Conferences with leading officials at the Institute of Permafrost Studies, the Ministry of Geology and Preservation of Natural Resources, and other organizations might reveal valuable information on permafrost problems possibly related to military support.

(6) Design and quality of equipment -- Valuable information can be obtained on both Soviet field and laboratory permafrost testing apparatus. Field equipment would include such items as ground thermometers, samplers, drills, and possibly geophysical testing apparatus. Laboratory equipment would include apparatus for making microscopic structural studies, water content tests and accurate determinations of load limits, deformation constants, shearing strengths and other characteristics of frozen ground. Information on the accuracy, design, field adaptibility and limitations of instruments would be valuable in the evaluation of Soviet capabilities. Sources, and availability of equipment could also be ascertained as could extent of usage of foreign apparatus.

(7) Field party operations -- Valuable information can be obtained on competence and numbers of personnel, on usage of new and established field techniques, and on areas of operations. The unwillingness of Soviet officials to allow observation of permafrost research activities in certain areas might be indicative of sensitive operations.

(8) Educational facilities -- It is important that the intelligence community gain information on present Soviet educational facilities instructing in permafrost. Data on courses taught, student quality, and current research trends would make possible improved future estimates on Soviet capabilities in theoretical and applied permafrost research.

(9) Research and development facilities -- The ability of the Soviets to expand their capabilities in permafrost work are heavily dependent on their research organizations. Any information on quality and quantity of personnel, current research, operating budgets, current International Geophysical Year and routine operations and future planning are all of high intelligence value. Substantial information for future estimates could thus be accrued.

b. Potential Soviet intelligence gain from exchanges

(1) Basic laboratory and field research on permafrost -- There would be little Soviet gain in this area since results of US basic laboratory and field research are generally promptly available in the open literature. Any accrual to the Soviets would probably be limited to their opportunity to observe first-hand current refined US laboratory and field testing equipment and techniques.

(2) Applied permafrost research related to airstrip, road, and railroad construction -- Although information on US activities is largely available in the open literature, the Soviets might gain somewhat if given an opportunity to closely examine airstrips and other facilities in Alaska. This exchange will not consider Soviet visits to US installations in Greenland or Canada because of the national defense (DEW Line, etc) and foreign implications involved.

(3) Applied permafrost research related to industrial and city development -- A visit by a Soviet team to Alaska to observe applied permafrost research in industrial and city development will result in little gain to the USSR. There are many similar engineering projects in the USSR and the Soviets are considered thoroughly familiar with the associated permafrost problems. US data on this general field is also freely available in technical publications.

(4) Other applied permafrost research -- The Soviets might gain minor details on permafrost research support in mining operations and water supply in the Alaskan area. Most of the information concerning these fields is freely available in technical publications.

(5) Organization of permafrost research -- There would be little Soviet gain since organizational details of the US permafrost research effort are for the most part freely available in the open literature.

(6) Design and quality of equipment -- The Soviets are generally well advanced in the design of laboratory and field permafrost testing equipment. Except for minor design features probably not published there is little they can gain by a first-hand inspection of US instrumentation.

(7) Field party operations -- Most of these details may be found in the open literature. The Soviets, however, could gain minor details on field techniques and the competence of personnel.

(8) Educational facilities -- This information is available to the Soviets in catalogues of educational organizations and other open literature. Very few US higher educational institutions teach permafrost as a separate science.

(9) Research and development facilities -- With the exception of details on a relatively small amount of classified work, the information on research and development facilities is freely available in technical journals or in libraries. Soviet gain would be marginal.

c. Balance of US gain and Soviet gain

In consideration of the above analysis of potential US versus Soviet gain, the intelligence advantages for the US would clearly outweigh any gains that would accrue to the Soviets. There would be little available to them that is not already in the open literature. It is likely, however, that the Soviets would obtain increased knowledge on the design details of US testing equipment and on actual efficiency of field operations.

The Ad Hoc Subcommittee for Permafrost Exchange therefore recommends that an exchange of delegates of permafrost personnel between the US and the USSR be implemented.

2. Scope

The exchange should be concerned mainly with the research and development facilities and applied field work in permafrost. Field aspects of the Soviet International Geophysical Year (IGY) program in glaciology could also be examined since work in this discipline is closely allied with that in permafrost. Research and development in the field of soil mechanics, a possible pending exchange, would best be treated separately, since it would concern basically different personnel and organizations from those in permafrost.

3. Itinerary

It is proposed that the visiting Soviet delegation be given a US tour including visits to US Geological Survey (USGS) Headquarters, Washington, D. C and Menlo Park USGS District Office, California; Snow Ice and Permafrost Research Establishment, (SIPRE), Wilmette, Illinois; Arctic Construction and the Frost Effects Laboratory, Boston, Mass. Observations by the Soviets of US field work in permafrost would be restricted to selected SIPRE and USGS field projects in Alaska, including those at Point Barrow Copper River Basin, and Fairbanks. Stanford University, California should be visited

and as time would permit other educational facilities including possibly Dartmouth and Harvard. It is suggested that the itinerary for the US delegation should include visits to leading Soviet permafrost research and development organizations located in Moscow and Leningrad. Also included in the US ininerary is a proposed field trip or series of field trips to established permafrost field stations at Vorkuta, Igarka, Anadyr and Yakutsk, IGY permafrost-glaciological stations at Suntar-Khayata and Zagorsk, observation of city construction of Tiksi, and of railroad construction in the Barkal-Amur-Magistral (BAM) region. The proposed duration of the US stay in the USSR is 20 days, preferably during late spring (May-June) or early fall when qualified US personnel would most likely be available.

Listed below are suggested high priority permafrost-glaciological research and development organizations to be visited by the US delegation. Actual and "cover" reasons for the visits are included.

a. Moscow

(1) Institute of Permafrost Studies Imeni Obruchev, Acad. Sci. --

(a) Actual reason -- This organization is the Soviet focal point for permafrost research and development. Valuable information can be obtained on laboratory research projects, equipment, also on the overall administration of the permafrost research program. Extent of support to military organizations could also possibly be determined.

(b) "Cover" reason -- To observe general permafrost research

(2) University of Moscow --

(a) Actual reason -- This institution is the main instructional organization for permafrost. Valuable information can be obtained, types of courses, quality of students, laboratory techniques and equipment, experimental research, and expeditionary activity.

(b) "Cover" reason -- To observe general educational facilities.

(3) Institute of Geography, Academy of Sciences --

(a) Actual reason -- To observe work being done on terrain evaluation and glaciology. This is the main Soviet institute for IGY glaciological studies.

(b) "Cover" reason -- To observe general geographical research.

(4) All-Union Scientific Research Institute of Hydrogeology and Engineering Geology --

(a) Actual reason -- To observe work being done on water survey (water supply in permafrost regions) and on exploitation of water resources.

(b) "Cover" reason -- To observe general hydrogeological research.

b. Leningrad

(1) Arctic Scientific Research Institute, Chief Directorate of the Northern Sea Route --

(a) Actual reason -- To observe laboratory techniques and various projects on permafrost. Also to determine the type and extent of IGY permafrost - glaciological field work being done by the Institute on Franz Josef Land (Tikhaya Bay)

(b) "Cover" reason -- To observe general Arctic research.

(2) Scientific Research Institute of Arctic Geology, Ministry of Geology and Preservation of Natural Resources --

(a) Actual reason -- To observe instrumentation and laboratory work in permafrost.

(b) "Cover" reason -- To observe general Arctic research

c. Permafrost Field Stations, Institute of Permafrost Studies Imeni Obruchev --

(1) Yakutsk
(2) Anadyr
(3) Skovorodino (ministerial subordination)
(4) Igarka
(5) Vorkuta

(a) Actual reason -- Visits to the permafrost field stations would be valuable for observing frozen ground research at station facilities, housing projects, railroads, landing fields, hydroelectric plants, wharfage and other port facilities, over-the-beach supply areas, and at any strategic military construction sites.

(b) Cover reason -- To observe permafrost station facilities.

d. IGY Glaciological - Permafrost Stations, Institute of Permafrost Studies Imeni Obruchev --

(1) Suntar-Khayata
(2) Zagorsk

(a and b) Actual and "Cover" reasons -- To observe IGY research in glaciology and permafrost.

e. Baikal-Amur-Magistral (BAM) Region --

(a and b) Actual and Cover reasons -- To observe permafrost research in support of railroad construction.

f. Tiksi --

(a) Actual reason -- To observe permafrost research in support of port construction and aggredation of permafrost under deltaic conditions, and extent of landing or supply facilities approximately 250 miles along the coast both east and west of Tiksi

(b) "Cover" reason -- To observe housing construction in permafrost areas.

4. Personnel

a. A nine-man U.S. team is suggested for the exchange, consisting of eight specialists in different phases of permafrost and one intelligence official with Russian language capability.

b. The US delegates will be primarily selected on the basis of scientific competence and experience in their specialized fields. These scientists are also selected with consideration as to the likelihood of their cooperation with U.S. intelligence representatives. The U.S. Geological Survey appears to be the most logical organization to sponsor the group, members of which should be given a short intensive language training course in Russian.

c. Possible choices for these personnel are as follows:

(1) Dr. Robert Black; University of Wisconsin; specialist in ice crystallography and the structure of ice.

(2) W. Keith Boyd; Snow Ice and Permafrost Research Establishment, Corps of Engineers, Wilmette, Ill.; specialist in applied research of frozen ground.

(3) Wm. E. Davies; US Geological Survey, Washington, D. C.; specialist in applied permafrost research - airfields.

(4) David M. Hopkins; U.S. Geological Survey; Menlo Park, California; specialist in geological history of permafrost - Pleistocene

(5) Arthur H. Lachenbruch; U.S. Geological Survey, Menlo Park, California; specialist in the theoretical aspects of permafrost heat conductivity and transfer.

(6) Donald R. Nichols; U.S. Geological Survey, Washington, D. C.; specialist in terrain and mapping of permafrost.

(7) Dr. Troy Péwé; U.S. Geological Survey, Menlo Park, California; specialist in geomorphological permafrost features.

(8) Dr. Lincoln Washburn; Dartmouth College; specialist in permafrost soil structures.

(9) A qualified representative of the U.S. intelligence community with a fluent Russian language capability.

5. Documentary Material

It is highly desirable that the U.S. delegates be furnished with descriptive material of facilities to be visited prior to the trip. All Soviet permafrost literature should be obtained whenever possible, but this should not be made a pre-condition of the exchange.